Intelligent Transportation Systems
Field Operational Test
Cross-Cutting Study

Hazardous Material Incident Response

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16. Abstract

Hazardous Materials Incident Response Cross-Cutting report summarizes and interprets the results of three Field Operational Tests (FOTs) that are evaluating systems for improving the accuracy and availability of HazMat information provided to emergency response personnel. The FOTs considered in this report are: Tranzit Express Systems, Tranzit Express Systems II and Operation Response. The report findings are organized in the categories of impact, user response, technical lessons learned, institutional challenges and resolutions, and cost to implement. The FOTs from which this report was drawn did not specifically address technical performance issues. The focus was on anecdotal evidence. The tests revealed several institutional challenges in the areas of motor carrier participation, privacy and enforcement, and jurisdictional concerns. This report highlights the successes and challenges that these tests encountered while attempting to develop the technologies appropriate for responding to HazMat incidents.

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EXECUTIVE SUMMARY

On a daily basis in the US, freight carriers move an estimated 700,000 shipments of hazardous materials (HazMat). To provide an appropriate level of safety for the public in the event of an incident, emergency response personnel need timely accurate information about the contents of HazMat shipments. This report summarizes and interprets the results of three Field Operational Tests (FOTs) that are evaluating systems for improving the accuracy and availability of HazMat information provided to emergency response personnel. The report findings are organized in the categories of impact, user response, technical lessons learned, institutional challenges and resolutions, and cost to implement.

The impacts of the use of these systems are in two areas: time savings and accuracy of the response. Test personnel assessed user response using questionnaires and interviews. Users of the systems felt that these systems would decrease the time necessary to identify the character of the HazMat cargo and also reduce the time spent selecting the appropriate response to the incident. They also perceived the systems to be more effective, accessible, and somewhat more accurate as sources of information than the information they are currently using.

However, users would not replace their current systems but rather would add the tested systems to their arsenal of information sources. Test participants felt that the record keeping ability of these new systems would be an improvement over their current systems.

The FOTs from which this report was drawn did not specifically address technical performance issues. Nevertheless, anecdotal evidence indicates that those systems in actual use are performing as designed. The most important technical lesson learned was that it is somewhat difficult and complex to remotely query a vehicle transponder under certain conditions.

The tests revealed several institutional challenges in the areas of motor carrier participation, privacy and enforcement, and jurisdictional concerns. To assure that that responders can effectively respond to incidents, there must be broad, nearly universal enrollment of carriers into the systems. Obtaining the participation of smaller or less sophisticated motor carriers is likely to be more difficult than within railroads or larger motor carriers. Carriers perceive that the use of these systems could facilitate increased enforcement or could divulge sensitive proprietary information to competitors. These issues must be satisfactorily resolved in order to assure the broad carrier participation necessary for ultimate success of systems such as these tested. In addition, the tests experienced reduced effectiveness because of conflicts among agencies that do not customarily work together. Future HazMat incident response projects must adequately address these institutional challenges.

The initial software and training costs to emergency response agencies to implement a version of the current Operation Respond system, based on these tests, is less than $700 for the first year and $350 for succeeding years. Participating carriers provide the HazMat information at their own expense. Participants indicated these costs are reasonable.

This report highlights the successes and challenges that these tests encountered while attempting to develop the technologies appropriate for responding to HazMat incidents.

REPORT BACKGROUND

In 1991, the U.S. Department of Transportation (USDOT) initiated a new program to address the needs of the emerging Intelligent Transportation Systems field. The program solicited and funded projects, called FOTs. The tests were sponsored and supported by several administrations of the Department, including the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), and the National Highway Traffic Safety Administration (NHTSA).

The FOTs demonstrated potentially beneficial transportation products, technologies, and approaches. The FOTs implemented these products, technologies, or approaches on a limited scale under real-world operational conditions. These tests were an interim step bridging the gap between conventional research and development (that formed the idea), and full-scale deployment (that would see wide-spread use of the idea). FOTs typically included a local or regional transportation agency, as well as the FHWA, as partners in the project. The partners often included private sector providers of the equipment, systems, and services interested in demonstrating their idea. The FOTs concentrated on user service areas needing a "proof of concept" in order to achieve deployment goals.

A fundamental element of each test was an independent, formal evaluation. The evaluation produced a final report that detailed the test's purpose, methods, and findings. The evaluation aspect of the test intended to assess whether the product, technology or approach provided effective solutions at acceptable levels of cost, schedule, and technical risk.

As the sponsoring organization and a partner in many of the FOTs, the FHWA played a central role. FHWA supported the tests by providing a standardized set of evaluation guidelines and by helping coordinate and promote the relationships among test partners. The FHWA also acted as the communications clearing house collecting reviewing, and disseminating information about the tests.

Among the more than 80 FOTs, several tests encompassed the same or similar areas of interest. The FHWA is preparing several "cross-cutting" studies that compare or synthesize the findings of multiple tests within a particular area of interest. The purpose of this series of studies is to extract from the separate tests the common information and lessons learned that are of interest to Intelligent Transportation Systems (ITS) practitioners and that could improve the testing and deployment of future applications of the subject technology.

This study focuses on the topic of HazMat incident response.

INTRODUCTION

SUBJECT BACKGROUND

In this country, there are an estimated 700,000 shipments of hazardous materials each day. The vast majority of these shipments are packaged properly, meet other stringent requirements, and arrive at their destination safely. The National Academy of Sciences (NAS), in its 1993 report *Hazardous Materials Shipment Information for Emergency Response*, estimated that between 10,000 and 20,000 motor carrier incidents and approximately 1,000 to 1,500 rail incidents that occur annually involve or threaten release of hazardous materials to which emergency response professionals are dispatched. In order to adequately protect the people living and working in their communities, public-sector law enforcement officers, fire fighters, emergency medical services personnel, and others require accurate, timely information when responding to a HazMat incident.

Responding to growing public awareness about the transportation of HazMat, Congress directed the USDOT to contract with NAS to study the feasibility and necessity of establishing a national central information reporting system for the shipment of all HazMat. The NAS study found that the information necessary for response at the scenes of HazMat incidents was not provided in a timely and reliable manner in about 25 percent of the truck cases and 10 percent of the rail cases. The NAS study concluded that there was a need to improve the information at the scenes of HazMat incidents, and rather than a central reporting system, they recommended that USDOT pursue other more cost effective measures. Subsequently, the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 mandated that two FOTs be conducted to address information deficiencies at HazMat incidents.

One of the test programs studied in this report examines a system which affords access to carriers' data bases containing cargo information. First responders having access to a carrier's data base could greatly improve the efficiency and confidence of their response to a HazMat incident. As a result, delays and dependence on shipping papers and manifests could be reduced, or eliminated.

The second test program, consisting of two FOTs, attempts to enhance access to data by storing information electronically in transponders and placing them directly on the HazMat shipment. The electronic information would replicate that which is required in shipping papers. Information would be gathered, processed and stored at an Operation Center, and placed in the electronic tag. A key advantage of this approach would be that first responders could gain access to the data without having to approach the vehicle.

This report was prepared using material gathered as part of Booz_Allen & Hamilton's work to provide evaluation oversight support to ITS FOTs. This material incorporates published and unpublished reports prepared by the test personnel and evaluators as well as information gathered in meetings and conversations with test and evaluation personnel. The reports prepared by the test personnel and evaluators present the findings, results, and conclusions of the tests themselves. This report interprets the results of a group of tests that have a common theme in an attempt to extract lessons that cut across the group of tests. Because it draws from the results of the tests as a group, this report may offer lessons and conclusions that are not found in the material from the individual tests.

FOTs Considered In This Analysis

This report draws its findings from three ITS FOTs. These three tests are:

- **Tranzit *XPress* Systems (TXS)**—conducted in Northeast Pennsylvania from 1996 to 1997. Tranzit *XPress* has been completed and a final evaluation report has been prepared.
- **Tranzit *XPress* Systems II (TXS II)**—ongoing at and around the city of Philadelphia, Pennsylvania. Evaluators have collected a limited amount of baseline data from participants in the Philadelphia area.
- **Operation Respond**—began in 1995 conducting tests in three locations including Atlanta, Buffalo, and Houston. The evaluation results are based on several simulated tests of HazMat incidents.

TXS

The TXS ITS FOT evaluated a method of enhancing the response to HazMat incidents. TXS consisted of a system of computer hardware/software designed for use by public agencies and private transport firms involved in HazMat transportation. The project employed advanced tracking and identification technologies and computerized emergency response information.

The primary goals of TXS were to demonstrate the ability to quickly identify the specific contents of a commercial motor vehicle involved in an incident and to demonstrate the ability to link systems that identify, store, and allow retrieval of data for emergency response to HazMat incidents.

The system had three separate components: the Information Dispatching/Operations Center, the On-Vehicle Electronics System, and Off-Vehicle Devices. The Information Dispatching/ Operations Center collected HazMat information from the shipper and stored the information appropriately in the system. One of the Center's computer applications communicated with the transporting vehicle via cellular modem to transfer shipping orders and to maintain status information. The system allowed the system operator to maintain and update shipping information. A map visualization product displayed the location of vehicles. A relational database stored customer, stop, bill of lading, and material data.

The On-Vehicle Electronics system had two subsystems, one in the cab (tractor) and the other in the cargo box (trailer). The tractor electronics included a hand-held personal computer for the driver's use and a Global Positioning System (GPS). Tractor electronics also included an external communications systems (cellular), an internal communications system (within the cargo box), and the necessary connections between all components. The electronics included wireless communications devices and electronic asset tags attached to the material in transit.

For incident notification, TXS operates in several ways. The system allows either the driver or emergency response personnel to report a situation and obtain information about the cargo.

In a non-emergency situation (for example, a leak is discovered while in transit), the driver could notify the shipping company or 911, requesting response personnel to assess the situation. The response personnel could electronically obtain information about the cargo to help determine the appropriate response.

If the vehicle was involved in an accident or other emergency situation, emergency dispatchers could begin notifying appropriate emergency response personnel based on knowledge of the cargo. When emergency personnel arrived at the scene, they could use electronic communications to verify and directly obtain information about the cargo from the electronic systems on the vehicle.

TXS II

The TXS II ITS FOT, as its name implies, is a second demonstration of the technology developed and demonstrated in the TXS project. This second project, operating in the Philadelphia, demonstrates the same HazMat identification and tracking technologies as TXS. It combines and refines the emergency response capabilities developed in TXS with those of Operation Respond (described below) and applies them to freight operations in Philadelphia. This second iteration of the technology is intended to demonstrate improved HazMat visibility and more efficient HazMat incident response. The test also plans to develop an open system design in accordance with the ITS National Architecture for HazMat incident response. This open design will enable future integration with other ITS technologies, systems, and services.

The extent of the information about TXS II that is used in this report is limited to work performed by the evaluators in preparation of a draft evaluation plan. This includes exploratory interviews with first responders in the Port of Los Angeles area and baseline information gathered for the draft Evaluation Plan.

Operation Respond

The Operation Respond ITS FOT demonstrates a HazMat identification and monitoring system called Operation Respond Emergency Information System (OREIS). The OREIS software system acts as a communications routing service between HazMat carriers and emergency response units and as a source of response guidelines and protocols. The project demonstrates several advanced communication and information handling technologies that provide information faster and more accurately. The goal of the test is to improve emergency response to HazMat incidents involving motor carriers and/or railroads.

Operation Respond provides a central point for the dissemination of HazMat information. Participating HazMat carriers (railroads and motor carriers) establish a database of information about the identification and contents of their HazMat shipments. The database may also contain information about how to respond to an incident involving the shipment. Each shipment registered in the database has an identification code.

In the event of an incident or accident involving a registered shipment, police and fire personnel can quickly obtain details of the shipment involved. The units responding to the incident can identify the shipment either by the railroad car ID or motor carrier ID. The police or fire dispatcher calls the OREIS point of contact. The dispatcher supplies the shipment code and the OREIS software directs the request for information to the correct carrier database. The dispatcher then obtains the details of the shipment and the suggested response protocol. Knowing the details of the shipment, the first responders can quickly request the appropriate equipment or materials necessary to contain, combat, or mitigate the effects of HazMat involved in the incident.

Test personnel are evaluating the system's ability to improve response time to HazMat incidents and to ensure that the appropriate organizations and equipment respond to the incident. They are also evaluating the system's ability to improve the accuracy of the response—applying the appropriate treatment based on a better knowledge of the materials involved.

FINDINGS

The following sections present the findings of this report. The findings present the comparison of the similarities and differences of these three tests and an interpretation of the results. The report organizes the findings into five categories.

- **Impacts**—whether the results of the tests caused changes
- **User Response**—how test participants reacted
- **Technical Lessons Learned**—conclusions about the technologies tested
- **Institutional Challenges and Resolutions**—conclusions about the relationships among the test partners, institutional barriers, and legal issues
- **Cost to Implement**—how the costs may affect the potential development and deployment of the technologies

IMPACTS

These FOTs have focused primarily on improving the response to HazMat incidents by decreasing response time and improving the response strategy selection. Results from the tests in these areas have been helpful in determining whether these new approaches to incident response are practical for widespread deployment. The tests identified significant potential to reduce response times and assist in response strategy selection.

Time Savings

Timeliness is an obvious key component in the successful response to an incident. Reducing time spent identifying the HazMat and implementing the correct response could have many benefits, including:

minimizing environmental and public health impacts by minimizing the amount of material which escapes, reducing the area affected, and initiating mitigation measures more quickly

- minimizing resources expended by response agencies, who typically assume worst case scenarios and deploy equipment and personnel accordingly (e.g., non-reusable protective suits)
- minimizing traffic impacts

The TXS test demonstrated the system to an audience of 24 first responders and 28 motor carrier safety officers. These experts were asked to estimate the duration of several phases of a typical incident, for situations where TXS was available and where it was not. A comparison of average times indicates responders and motor carriers believe that some phases will be shortened with the use of TXS. Time savings in multiple phases are not necessarily additive, however, due to the likelihood that some activities may occur in parallel. Those instances of time savings as perceived by first responders and motor carriers, where the evaluator determined the change to be statistically significant, are presented in Table 1. (Details regarding the statistical analysis can be found in Goulias, et al., 1997 see Bibliography.)

Operation Respond conducted simulated HazMat incidents to which emergency crews reacted, both with and without the use of Operation Respond. These drills were conducted at Tonawanda, New York truck yard, and Atlanta, Georgia and Buffalo, New York rail yards. Among these three simulated incident tests, the most pertinent phase was the time from when the response team arrived at the scene to when a positive identification of the HazMat was made and the appropriate response decided. The times presented here in Table 2 are actual times measured during the simulations.

Table 1
Estimated Response Activity Times

Emergency Response Phase	**First Responder Time Estimates (minutes)**		**Carrier Time Estimate (minutes)**	
	Without TXS	*With TXS*	*Without TXS*	*With TXS*
Hazardous material cargo recognition and identification	15.3	10.1	15.5	5.6
Emergency management agency or HazMat team notification of an incident	21.7	15.9	20.7	7.3
Time required for secondary responders to reach the site	58.0	45.8	48.9	42.3

Table 2 Simulated Incident (Drill) Response Tea		
Simulation Location	**Time required to identify hazardous material and select correct response**	
	Without Operation Respond	*With Operation Respond*
Atlanta, Georgia, rail yard	30 minutes	20 minutes
Tonawanda, New York truck yard	34 minutes	20 minutes
Buffalo, New York rail yard	52 minutes	34 minutes

Although this data is not statistically significant, the use of these systems appears to have the potential to reduce the time required to positively identify the HazMat involved in the incident and to select the appropriate response. Participants indicate that this time savings could have several positive impacts. Primarily, the implications are that less HazMat will be leaked and cleanup procedures can begin sooner. Participants would also anticipate a reduction in resources expended dealing with the incident, such as eliminating unnecessary equipment deployment.

Accuracy of Response

After the material has been identified, the next step is the implementation of actions to correct the situation. Both systems provide information to the first responder, HazMat team, and emergency management unit that facilitate selection of a response to the incident. First Responders were consistent in reporting that more information is better and that if these systems were available they would be used. Further, they indicated the use of the systems would increase confidence that the correct material identification had been made and that the response about to be implemented was the optimally correct one.

USER RESPONSE

User response to the systems, collected through various questionnaires and interviews, were consistent in several areas. Existing emergency

response information sources are considered to be generally good but not outstanding, and most have a some weakness. Consequently, multiple sources of information are required to confirm cargo contents. The OREIS and TXS systems were considered to be generally better as an information source in almost all areas. However, users feel that neither is suitable as a replacement for the other systems, and that they would be used to supplement current procedures. Both systems were perceived as being more effective than current systems in determining the optimal emergency response and cleanup strategy.

Information Systems

Current information sources include placards, shipping papers, crew members, United Nations and railcar ID numbers, the Chemical Transportation Emergency Center (CHEMTREC), North American Emergency Response Guidebook (NAERG), and the carrier. Participants in the tests were asked to judge these information sources based on:

- **Accessibility of Information**—Is the source of information typically available to the first responder at the scene of an incident?

- **Usefulness/Effectiveness**—Does it provide information necessary for the responder to make an informed decision regarding the response strategy?

- **Reliability/Confidence in Information**—Is the responder confident that the information provided reflects the actual cargo contents?

OREIS and TXS were rated in accordance with these classifications, while TXS II was not. Users indicated a wide range of satisfaction with existing information systems, with no system receiving universal praise for its performance. Exhibit 1 provides a summary of the first responder user perceptions regarding various information systems. The trend appears clear.

These ratings are based on responses from TXS and Operation Respond, first responder participants. Scores are presented on a five point scale, with one being excellent and 5 being very poor.

Although results are not statistically significant, it appears that both Operation Respond and TXP are perceived to be better than existing information sources in terms of usefulness and accuracy. Further, Operation Respond is perceived to be more accessible. Because questions regarding usefulness, accessibility, and accuracy were asked in somewhat different ways among the tests, these scores should be viewed only as an indication of user perception. Motor carrier perceptions of information sources are not included, but based on the results obtained from TXS, their perceptions of current systems are similar.

In spite of the favorable impression most emergency responders had regarding these systems, users indicate they would treat these systems as supplemental information sources. They would add to the confidence they had in

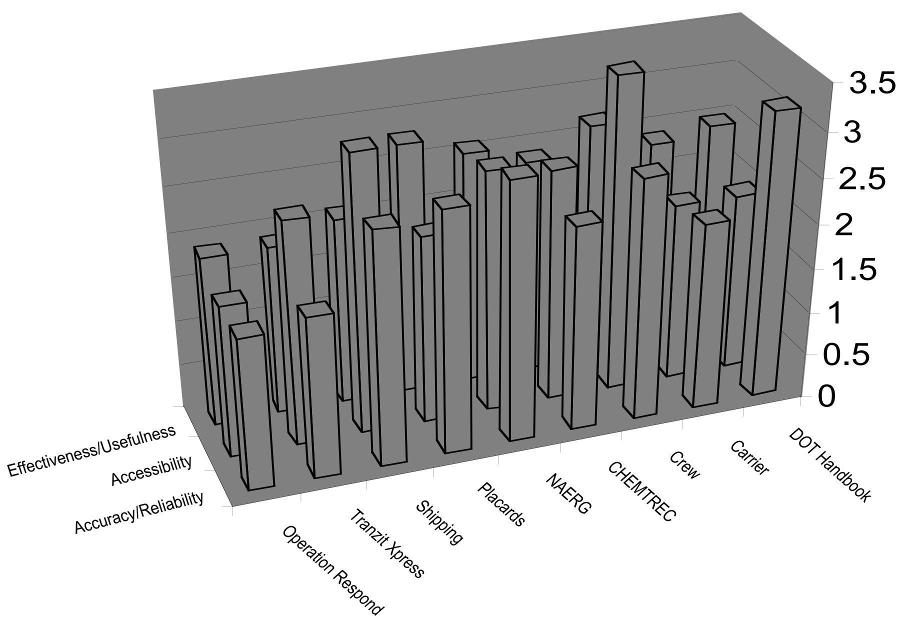

Exhibit 1 HAZMAT Information Source User Perceptions

selecting a response strategy, perhaps allowing a more rapid response. The emergency response community is clearly of the opinion that more information is better.

Other Aspects

As a record keeping system, TXS was perceived by carrier and responder users as a potential improvement over current systems. They felt the TXS system would be better at maintaining safety and efficiency, tracking hazardous material loads, accurately reflecting mixed loads, and helping to assure that motor carriers comply with HazMat regulatory requirements.

Participants in both OREIS and TXS perceive that the systems would be more effective in determining the optimal emergency response and cleanup strategy. Information regarding health and fire hazards, public safety, and fire, spill, or leak response is provided along with the identification of the material itself. This type of information was perceived to be as good as, and in some cases better, than that which would be obtained through other sources such as the NAERG.

The overall perception users have of these systems might be summed up in their intention to use the system. The relatively widespread use of Operation Respond in the rail industry is an indication that it is being accepted in the emergency response community. The fact that virtually all major railroad carriers are participating in Operation Respond is an indication of good user acceptance of that system.

Half of the first responders indicated they would like to use a system such as TXS. However, motor carrier response to TXS is not as good; only three of 28 participants indicated they would like to use TXS.

TECHNICAL LESSONS LEARNED

HazMat incident response systems are not developing cutting edge technology for the world of emergency response or transportation. They are introducing new technical configurations and system integration concepts. Neither evaluation of Operation Respond or TXS specifically addresses technical performance of the system or its components.

The Operation Respond system performed as designed during the simulations and evidently, during actual use by numerous emergency response agencies. Operation Respond has been implemented in over 350 locations and, in follow-up discussions with some of the users, the evaluator has not received any indications of system failure.

TXS was developed sufficiently to demonstrate it in a classroom setting. The project included installation of the system on a small fleet of trucks as part of the system component development process. The problems that arose were generally attributed to the field testing being conducted before all the technical problems were solved. Many of the problems could be attributed to the complexities of system and data integration.

The single biggest technical lesson learned is the appreciation gained for the difficult and complex problem of remote interrogation of the vehicle electronics. The TXS concept holds that a first responder could remotely query the master vehicle transponder for cargo information and the master tag would broadcast the contents. Shipment data would be transmitted on an emergency radio frequency in a synthesized voice and in a data stream. This concept was successfully demonstrated using a Ka band radar gun to stimulate the vehicle electronics and a police radio to receive the information. Number of issues require resolution. Finding or developing a query device:

- Which most first responders have or could acquire cost effectively
- With sufficient range to be useable from a safe distance from the vehicle, up to a quarter mile
- That prevents avoiding unintended broadcast of shipment information over emergency or other frequencies due to inadvertent stimulation of the vehicle electronics
- For assuring cargo content information security from access by those not authorized
- For first responders to receive the information in an easily decipherable manner, either audibly or electronically

INSTITUTIONAL CHALLENGES AND RESOLUTIONS

ITS projects in the HazMat incident response arena have uncovered numerous institutional challenges. Addressed here are carrier participation, privacy and enforcement concerns, and jurisdictional issues.

Carrier Participation

The ultimate success of any system designed to aid emergency response will be directly proportional to the percent of instances when the system can be of use. If an incident occurs involving a non-participating rail or motor carrier, then the system will not be of use to the first responders. The fundamental problem identified in the NAS study was that in 10 to 25 percent of HazMat incidents information is not available in a timely and reliable manner. It has not been established to what degree these systems will reduce the occurrence of information deficiency, or whether they will simply improve the response to incidents which would have had adequate information sources anyway.

To assure that these systems impact the incidents in which information is deficient there must be broad, nearly universal enrollment of carriers into the systems. This is likely to be much easier to achieve among railroads, where the number of carriers is small, and the industry is somewhat more stable. The eight largest US railroads and several large trucking companies are participating in Operation Respond. Several large HazMat carriers have indicated an interest in participating in TXS. These carriers perceive benefits to participation such as improved safety, cost savings associated with cleanup, and potential insurance cost reductions.

The greatest challenge will be in enlisting the support and participation of the smaller or less technologically sophisticated carriers; those carriers who are not currently automated or have limited automation in record keeping and fleet and cargo management. It is also possible that these less sophisticated carriers are more likely to be characteristic of the types of carriers involved in incidents with the problematic information deficiency.

Enforcement/Privacy

For both TXS and Operation Respond, the opportunity for enforcement agencies to monitor HazMat shipments presents itself. Enforcement and compliance with HazMat shipping regulations has traditionally been a difficult problem to solve. Those agencies responsible for enforcement were often quick to identify these projects as a potential means of aiding enforcement activities. The ability to inquire about the contents of a vehicle, whether at the vehicle or through some central data base or control center, could allow enforcement agencies to selectively target those vehicles or companies for inspection activities. For Operation Respond, it is possible that the contents of a vehicle(s) could be obtained from the 911 dispatcher given the ID number on the vehicle. Participating carriers raised the concern that these systems not be used to invite greater scrutiny upon them than non-users.

TXS participating carriers particularly noted that a system which automatically reported an incident could substantially increase their costs. Management of minor incidents may often be handled without emergency responders. Incident responders, on the other hand, reported that carriers do not always report incidents and that to ensure safety it is necessary that they be informed about incidents as soon as they occur. This presents a behavioral issue as well as an enforcement issue.

It is further possible that competing interests could gain some advantage by monitoring the cargo contents of the project participants. The ability to inquire about the contents of a vehicle without the knowledge or consent of the vehicle operator might be possible. For TXS, the potential exists for anyone with a remote query device and proper receiving equipment to access cargo information directly from the vehicles on-board electronic systems.

For these tests the participating enforcement agencies agreed that no enforcement activity would be undertaken. However, these issues of data security and enforcement have not been addressed on a permanent basis. It is necessary for the success of the incident response systems that this issue be resolved. Voluntary enrollment of rail and motor carriers is essential to the success of these projects and recruiting them would be much more difficult with these issues unresolved.

Jurisdiction

One of the problems many transportation policy efforts face is the fragmentation of jurisdictions. Usually, cooperation among emergency response agencies is excellent. However, ITS technologies and networks cross geographical and legislative boundaries, bringing together various levels of agencies and departments who are often unaccustomed (or averse) to working with each other. To varying degrees, both projects experienced difficulties due to such interjurisdictional disagreements, resulting in less effective tests.

Typically, successful ITS projects are ones in which institutional barriers are adequately addressed. This usually results when all the appropriate stakeholders are included in the project from the very earliest stages. Breaking down interjurisditional barriers may be accomplished by the formation of steering committees, working groups, and the like. Steering committees are invaluable in the establishment of overall plans and the identification of resources and requirements. Working groups may help foster agreement on issues such as training needs and technology requirements.

COST TO IMPLEMENT

Operation Respond is available to local and regional emergency response agencies on a subscription basis for $695 for the initial year and $350 per year thereafter. The cost includes installation of the software and training 911 dispatchers in its use. It also includes any software updates. Carriers are participating on a voluntary basis. Costs associated with making the HazMat cargo information available to Operation Respond is borne by the carriers. Most Operation Respond users and test participants feel their current subscription prices are reasonable.

TXS has not generated any estimates of overall system cost or indicated expected fees to be charged to users. Potential users of TXS, both motor carriers and first responders, indicated concern about the perceived relatively high initial cost of system components. High operating costs would make the system economically unfeasible for many carriers.

SUMMARY

HazMat incident response FOTs have been successful in demonstrating potential benefits. Both simulated incident measurements and users perception measurements indicate these systems can potentially save community resources by reducing routine HazMat team response times, unnecessary evacuations, and unjustified highway and track closings. Users believe these systems could increase the confidence they have in making response decisions. Emergency responders have indicated that they would like to have available these additional sources of information.

The technical challenges of placing information directly on the cargo and/or vehicle in an electronic form and being able to access that information are continuing to be addressed in ongoing operational tests. Gaining access to information in carrier data bases has been successfully demonstrated.

As with many ITS operational tests, the institutional issues are often more significant than technical issues. In those cases, the greatest challenges lay in achieving a high level of carrier participation and assuring a continued high level of interjurisdictional cooperation.

The NAS report indicated that the response to 10 percent of rail and 25 percent of truck carrier HazMat transportation incidents suffers from information deficiency. The success these projects will have in impacting that problem is still largely undetermined. The continued operational testing of TXS II and Operation Respond should address this question.

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